REMARKS

The Office Action dated November 16, 2006 has been received and carefully noted. The above amendments to the abstract, claims, and the following remarks, are submitted as a full and complete response thereto.

In accordance with the foregoing, claims 1-16, 22-24, and 27 have been amended to improve clarity of the features recited therein and new claim 28 is presented, which corresponds to independent claim 1, but including means-plus-function terminology. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1-28 are pending and under consideration.

IN THE ABSTRACT:

On page 2 of the Office Action, the Abstract was objected to because it exceeded 150 words. In response, a new Abstract is being presented to resolve the objection thereto.

Accordingly, it is respectfully requested that the objections to the Abstract be withdrawn.

REJECTION UNDER 35 U.S.C. § 112:

On page 2 of the Office Action, claims 1 and 11 were rejected under 35 U.S.C. § 112, second paragraph, for indefiniteness.

In response, the claims have been amended to improve clarity and antecedent support.

Accordingly, it is respectfully requested that the § 112, second paragraph rejections to the claims be withdrawn.

OBJECTIONS TO THE CLAIMS:

In the Office Action, at page 2, claim 1 was objected to for a minor informality. Claim 1 has been amended to correct such minor informality. Accordingly, it is respectfully requested that the objection to the claim be withdrawn.

REJECTION UNDER 35 U.S.C. § 103:

On page 3 of the Office Action, claims 1, 3, 6-11, 13, 16-17, 19, and 22-27 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent 6,377,620 to Ozluturk et al. ("Ozluturk") in view of U.S. Publication No. 2005/0063487 to Sayegh ("Sayegh"). The Office Action took the position that Ozluturk and Sayegh disclose all the aspects of independent claims 1, 11, 16, and 27. The rejection is traversed and reconsideration is requested.

Independent claim 1, upon which claims 2-10 are dependent, recites a digital imbalance correction device, including an input unit configured to receive first input signals containing a plurality of channels from an I/Q converter stage at respective input terminals, each input terminal being associated to a respective signal branch, a time-to-frequency-domain-transformer configured to perform a transformation of said first input

signals from time-domain into frequency-domain, the transformation result being represented as a power spectrum of said respective first input signals, and a subtracting unit configured to receive at its inputs second input signals which are represented by the power spectra of said respective transformed first input signals and to output a gain difference as a function of frequency at its output. The digital imbalance correction device also includes a cross-correlator configured to receive at its inputs third input signals based on said first input signals, and to output a cross-correlation of said third input signals, said cross-correlation output being proportional to a phase error between said respective correlation input signals, and a gain corrector arranged in one of said respective signal branches and configured to receive at its input a fourth input signal based on said associated first input signal. A gain of said fourth input signal is corrected based on said power difference spectrum such that said gain of said fourth input signal equals the gain of the other one of said first input signals. The device also includes a phase corrector arranged in one of said respective signal branch and configured to receive at its input a fifth input signal based on said associated first input signal. A phase of said fifth input signal is corrected based on said cross-correlation output, such that said phase of said fifth input signal is in quadrature relation to the other one of said first input signals.

Independent claim 11, upon which claims 12-15 are dependent, recites a digital imbalance correction method, including inputting first input signals including a plurality of channels and resulting from an I/Q conversion, time-to-frequency-domain-

transforming said inputted first signals to perform a transformation of said first input signals from time-domain into frequency-domain, the transformation result being represented as a power spectrum of said respective first input signals, subtracting the power spectra of said respective transformed first input signals and outputting a gain difference as a function of frequency, performing a cross-correlation based on said first input signals, and outputting said cross-correlation which is proportional to a phase error between said respective correlation input signals, and performing a gain correction for said first input signals based on said power difference spectrum such that said gain of said first input signals equals each other. The method further performs a phase correction for said first input signals based on said cross-correlation such that said phase of said first input signals is in quadrature relation to each other.

Independent claim 16, upon which claims 17-25 are dependent, recites a digital imbalance correction device, including an input unit configured to receive first input signals, a time-to-frequency-domain-transformer configured to perform a transformation of the first input signals from a time-domain into a frequency-domain and to output a power spectra of the transformed first input signals, a subtractor configured to receive second input signals, which are based on the power spectra, and to output a gain difference of the second input signals as a function of frequency, and a cross-correlator configured to receive third input signals, which are based on the first input signals, and to output a cross-correlation of the third input signals. The cross-correlation output is proportional to a phase error between the third input signals. The device also includes a

gain corrector configured to receive a fourth input signal, which is based on at least one of the first input signals, and to correct a gain of the fourth input signal using a difference of the power spectra so that the gain of the fourth input signal equals the gain of the other first input signals, and a phase corrector configured to receive a fifth input signal, which is based on the at least one of the first input signals, and to correct a phase of the fifth input signal using the cross-correlation output so that the phase of the fifth input signal is in a quadrature relation to the other first input signals.

Independent claim 27 recites a digital imbalance correction device, including an input unit configured to receive first and second input signals, a time-to-frequency-domain-transformer configured to perform a transformation of the first and second input signals from a time-domain into a frequency-domain and to output a power spectra of the transformed first and second input signals, a subtractor configured to receive the power spectra and to output a gain difference of the power spectra as a function of frequency, and a cross-correlator configured to receive the second input signal and to output a cross-correlation of the second input signal. The device also includes a gain corrector configured to receive the first input signal and to correct a gain of the first input signal using a difference of the power spectra so that the gain of the first input signal equals the gain of the second input signal, wherein the cross-correlation output is proportional to a phase error between the second input signal and the corrected first input signal or between the first input signal and the second input signal, and a phase corrector configured to receive the corrected first input signal, and to correct a phase of the

corrected first input signal using the cross-correlation output so that the phase of the corrected first input signal is in a quadrature relation to the second input signal.

Independent claim 28 recites a digital imbalance correction device, including input means for receiving first input signals containing a plurality of channels from an I/Q converter stage at respective input terminals, each input terminal being associated to a respective signal branch, time-to-frequency-domain-transforming means for performing a transformation of said first input signals from time-domain into frequency-domain, the transformation result being represented as a power spectrum of said respective first input signals, subtracting means for receiving at its inputs second input signals which are represented by the power spectra of said respective transformed first input signals and to output a gain difference as a function of frequency at its output, and cross-correlation means for receiving at its inputs third input signals based on said first input signals, and to output a cross-correlation of said third input signals, said cross-correlation output being proportional to a phase error between said respective correlation input signals. The device also includes gain correction means arranged in one of said respective signal branches and for receiving at its input a fourth input signal based on said associated first input signal, wherein a gain of said fourth input signal is corrected based on said power difference spectrum such that said gain of said fourth input signal equals the gain of the other one of said first input signals, and phase correction means arranged in one of said respective signal branch and for receiving at its input a fifth input signal based on said associated first input signal, wherein a phase of said fifth input signal is corrected based

on said cross-correlation output, such that said phase of said fifth input signal is in quadrature relation to the other one of said first input signals.

As will be discussed below, Ozluturk and Sayegh fail to disclose or suggest the elements of any of the presently pending claims.

Ozluturk generally describes a signal balancer balancing the amplitude and phase of a received QPSK signal that may have been corrupted during transmission. The system determines the amplitude of the I and Q symbols of a received signal, compares them, and applies a correction to one or both channels to correct for amplitude imbalance. For phase imbalance, the system calculates the cross-correlation of the I and Q symbols which should average to zero. A correction factor is derived from the cross-correlation and applied to both channels, returning the phase cross-correlation to zero. The output from the system is a signal corrected in both amplitude and phase.

Sayegh, in turn, generally describes digital signal processing (DSP)-based approach to parameter estimation modulation identification and interference characterization in connection with a satellite Communication Monitoring System (CSM). Sayegh allows automatic generation of satellite frequency plans (S74) without any a priori knowledge of such plans. Individual processes for carrier isolation (S71), segmentation (S72), frequency estimation (S73), symbol rate estimation, bit error rate estimation; modulation identification and interference characterization may be combined in a totally automated process.

However, a combination of Ozluturk and Sayegh would fail to teach or suggest, at least, "a cross-correlator configured to ... output a cross-correlation of said third input signals, said cross-correlation output being proportional to a phase error between said respective correlation input signals; and a gain corrector arranged in one of said respective signal branches and configured to receive at its input a fourth input signal based on said associated first input signal, wherein a gain of said fourth input signal is corrected based on said power difference spectrum such that said gain of said fourth input signal equals the gain of the other one of said first input signals...wherein a phase of said fifth input signal is corrected based on said cross-correlation output, such that said phase of said fifth input signal is in quadrature relation to the other one of said first input signals," as recited in independent claim 1.

As clearly provided in Ozluturk, the entire signal processing is in **a time domain** and **not** in frequency domain. (Emphasis added) Ozluturk specifically provides in column 3, lines 48-50, that the reference signal 39 is negative feedback to the upstream amplification stages 25I, 25Q. A positive control voltage at the gain input 49I, 49Q indicates a gain increase for that amplifier; a negative control voltage indicates attenuation. <u>See</u> <u>also</u> FIG. 2 of Ozluturk. The reference signal 39 produced for amplitude balancing (<u>see</u> FIG. 2 of Ozluturk) is a negative feedback to the upstream amplification stages. Thus, gain correction according to Ozluturk is accomplished using only time domain signals and using a feedback arrangement. Similarly, phase balancing according to Ozluturk is based on a feedback arrangement. <u>See</u> FIG. 3, and column 4, lines 1 to 5 of

Ozluturk. Therefore, contrary to the contentions made in the Office Action, the recitations of independent claim 1 and the feedback control arrangement by Ozluturk differ significantly.

The Office Action considers that the application of FFT processing is well-known and proved with reference to the document by Sayegh (See for example FIG. 2 steps S1, S2) so as to cure the deficiencies of Ozluturk.

However, Applicant respectfully traverses such contention. As previously indicated, the concept of Ozluturk is only based in time domain. Moreover, Ozluturk's configuration relies on a series arrangement of amplitude and phase balancing (See, for instance, FIG. 5 of Ozluturk in combination with column 4, lines 49 to 55). However, it is not reasonable and feasible for a skilled person to apply a frequency domain processing for one of these blocks and then followed again by a time domain processing in the other block. This would require a repeated time-to-frequency and frequency-to-time domain conversion. Aside from this, the mere substitution of the alleged power spectrum obtaining means as shown in FIG. 2 of Ozluturk and denoted by reference signs 29I and 29Q by a FFT is rather questionable. The devices denoted with 29I and 29Q according to Ozluturk are merely absolute value processors obtaining relative magnitudes of each incoming symbol. It is held that no power spectrum is related thereto. In addition, the difference concerning control schemes between the cited references would remain.

Accordingly, Ozluturk teaches away from combination between its own technique and the supervised technique of Sayegh. Thus, Applicant respectfully submits that the

proposed combination of Ozluturk and Sayegh is not obvious, because it is contrary to the conventional thinking reflected in the disclosure of Ozluturk. Applicant respectfully submits that this evidence of teaching away provides a further basis for withdrawing the rejection. Appropriate withdrawal of the rejection is respectfully requested.

Because independent claims 11, 16, 27, and 28 include similar claim features as those recited in independent claim 1, although of different scope, and because the Office Action refers to similar portions of the cited reference to reject independent claims 11, 16, 27, and 28, the arguments presented above supporting the patentability of independent claim 1 in view of Myerson are incorporated herein to support the patentability of independent claim 11, 16, 27, and 28.

Accordingly, Applicant respectfully request that independent claims 1, 11, 16, 27, and 28 and related dependent claims be allowed.

On page 11 of the Office Action, claims 2, 12, and 18 were rejected under 35 U.S.C. § 103 as being unpatentable over Ozluturk, Sayegh, and in view of U.S. Patent No. 6,151,356 to Spagnoletti et al. ("Spagnoletti"). The Office Action took the position that Ozluturk, Sayegh, and Spagnoletti disclose all the aspects of dependent claims 2, 12, and 18. The rejection is traversed and reconsideration is requested.

Because the combination of Ozluturk, Sayegh, and Spagnoletti must teach, individually or combined, all the recitations of the base claim and any intervening claims of dependent claims 2, 12, and 18, the arguments presented above supporting the

patentability of independent claims 1, 11, and 16 over Ozluturk and Sayegh are incorporated herein.

Spagnoletti generally describes a method and apparatus for detecting the phase difference between a digital data signal and a clock signal. By ensuring that no pulse in the output phase signal is narrow enough to introduce a non-linearity, the present invention avoids a source of non-linearity exhibited in existing phase detectors. In addition, by ensuring that critical timing paths through the circuit contain similar circuit blocks, with similar propagation delays, relative time relationships are preserved from clock and data inputs to XOR inputs.

However, contrary to the contentions made in the Office Action, Spagnoletti does not cure the deficiencies of Ozluturk and Sayegh. Similarly to Ozluturk and Sayegh, Spagnoletti is devoid of any teaching or suggestion providing, at least, "a cross-correlator configured to … output a cross-correlation of said third input signals, said cross-correlation output being proportional to a phase error between said respective correlation input signals; and a gain corrector arranged in one of said respective signal branches and configured to receive at its input a fourth input signal based on said associated first input signal, wherein a gain of said fourth input signal is corrected based on said power difference spectrum such that said gain of said fourth input signal equals the gain of the other one of said first input signals…wherein a phase of said fifth input signal is corrected based on said cross-correlation output, such that said phase of said fifth input signal is in quadrature relation to the other one of said first input signals," as recited in

independent claim 1. Rather, Spagnoletti simply provides a comparison of the phase signal with the reference signal provides an indication of the phase difference between the clock signal and the data signal, where the phase difference signal and the reference signal are provided responsive to only the rising or only the falling state transitions in the received data signal.

Accordingly, Ozluturk, Sayegh, and Spagnoletti, individually or combined, fail to teach or suggest all the recitations of independent claims 1, 11, and 16 and related dependent claims.

On page 11 of the Office Action, claims 4, 14, and 20 were rejected under 35 U.S.C. § 103 as being unpatentable over Ozluturk, Sayegh, and in view of U.S. Publication No. 2006/0133459 to Boulanger et al. ("Boulanger"). The rejection is traversed and reconsideration is requested.

Because the combination of Ozluturk, Sayegh, and Boulanger must teach, individually or combined, all the recitations of the base claim and any intervening claims of dependent claims 4, 14, and 20, the arguments presented above supporting the patentability of independent claims 1, 11, and 16 over Ozluturk and Sayegh are incorporated herein.

Boulanger generally describes a method for receiving spectrum spreading signals with frequency shift correction. According to Boulanger, the modulation period related to the Doppler effect is estimated by using a preamble and a correction signal is

elaborated, the signal transmitting the information is then corrected by this correction signal. Base band digital signals are operated upon by using the DOT and CROSS components. In Boulanger, the modulation period related to the Doppler effect is estimated by using a preamble and a correction signal is elaborated, the signal transmitting the information is then corrected by this correction signal. Base band digital signals are operated upon by using the DOT and CROSS components.

However, contrary to the contentions made in the Office Action, Boulanger does not cure the deficiencies of Ozluturk and Sayegh. Similarly to Ozluturk and Sayegh, Boulanger is devoid of any teaching or suggestion providing, at least, "a cross-correlator configured to ... output a cross-correlation of said third input signals, said cross-correlation output being proportional to a phase error between said respective correlation input signals; and a gain corrector arranged in one of said respective signal branches and configured to receive at its input a fourth input signal based on said associated first input signal, wherein a gain of said fourth input signal is corrected based on said power difference spectrum such that said gain of said fourth input signal equals the gain of the other one of said first input signals...wherein a phase of said fifth input signal is corrected based on said cross-correlation output, such that said phase of said fifth input signal is in quadrature relation to the other one of said first input signals," as recited in independent claim 1. Rather, Boulanger simply provides an estimation of a modulation period affecting the correlation signal resulting from the frequency shift and a correcting signal and correcting the correlation signal in a portion of the correlation signal

corresponding to the information symbols, said correcting means being capable of correcting the correlation signal via the correcting signal.

Accordingly, Ozluturk, Sayegh, and Boulanger, individually or combined, fail to teach or suggest all the recitations of independent claims 1, 11, and 16 and related dependent claims.

On page 12 of the Office Action, claims 5, 15, and 21 were rejected under 35 U.S.C. § 103 as being unpatentable over Ozluturk, Sayegh, and in view of U.S. Patent No. 6,262,981 to Schmutz ("Schmutz"). The Office Action took the position that Ozluturk, Sayegh, and Schmutz disclose all the aspects of independent claims 5, 15, and 21. The rejection is traversed and reconsideration is requested.

Because the combination of Ozluturk, Sayegh, and Schmutz must teach, individually or combined, all the recitations of the base claim and any intervening claims of dependent claims 5, 15, and 21, the arguments presented above supporting the patentability of independent claims 1, 11, and 16 over Ozluturk and Sayegh are incorporated herein.

Schmutz generally describes a method and apparatus for power management that controls the overflow of a digital combiner used in the transmit path for a broadband transceiver station (BTS) is disclosed. Power is managed by a digital word banking agent which is a part of the BTS system software. If a new channel request is received, the digital word banking agent determines if the request can be satisfied at the requested

power level. Otherwise, the digital word banking agent determines if the channel request can be satisfied at a lower power request. The digital word banking agent also manages active channels by reclaiming power from channels requiring less power and/or by allocating more power to the channels requesting more power.

However, contrary to the contentions made in the Office Action, Schmutz does not cure the deficiencies of Ozluturk and Sayegh. Similarly to Ozluturk and Sayegh, Schmutz is devoid of any teaching or suggestion providing, at least, "a cross-correlator configured to … output a cross-correlation of said third input signals, said cross-correlation output being proportional to a phase error between said respective correlation input signals; and a gain corrector arranged in one of said respective signal branches and configured to receive at its input a fourth input signal based on said associated first input signal, wherein a gain of said fourth input signal is corrected based on said power difference spectrum such that said gain of said fourth input signal equals the gain of the other one of said first input signals…wherein a phase of said fifth input signal is corrected based on said cross-correlation output, such that said phase of said fifth input signal is in quadrature relation to the other one of said first input signals," as recited in independent claim 1. Rather, Schmutz simply provides that if the digital word banking agent cannot satisfy a request, the digital word banking agent will queue the request for submission at a later time in the event that additional power becomes available.

Accordingly, Ozluturk, Sayegh, and Schmutz, individually or combined, fail to teach or suggest all the recitations of independent claims 1, 11, and 16 and related dependent claims.

CONCLUSION:

In view of the above, Applicant respectfully submits that the claimed invention recites subject matter which is neither disclosed nor suggested in the cited prior art. Applicant further submits that the subject matter is more than sufficient to render the claimed invention unobvious to a person of skill in the art. Applicant therefore respectfully requests that each of claims 1-28 be found allowable and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the Applicant respectfully petitions for an appropriate extension of time.

Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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